

REMARKS

Status of the Claims

Claims 1 and 3-8 are pending in the Application. Claims 1, 4, 5, 6, and 8 are currently amended. Claims 2 and 9 are canceled. Reconsideration and allowance of all of the pending claims is respectfully requested.

New matter is not being introduced in the Application by way of this amendment. The subject matter of claim 2 has been incorporated into claim 1, and claim 2 has been canceled. The subject matter of claim 9 has been incorporated into claim 8 and claim 9 has been canceled. Accordingly, entry of this amendment is respectfully requested.

Claim Objections

Claims 4-7 are objected to under 37 C.F.R. §1.75(c) as multiple dependent claims that further depend upon multiple dependent claims. Claims 4-6 are currently amended to singly depend upon claim 1 which addresses the objection. Claim 7 as filed is singly dependent upon claim 6 and was therefore improperly included in this objection. Withdrawal of the objection to the claims is therefore respectfully requested.

Claim Rejections - 35 U.S.C. §103(a)

Claims 1-3 and 8-9 are rejected under 35 U.S.C. §103(a) as unpatentable over Bontinck (U.S. Patent No. 5,541,251) in view of Burleigh (U.S. Patent No. 5,173,300) and Oertel (U.S. Patent No. 3,536,663). For the following reasons, this rejection is respectfully traversed.

Applicants respectfully submit that all of the elements of the present claims are not disclosed or suggested by the prior art. The prior art does not disclose or suggest using an antioxidant having the structure shown in formula (1). The prior art also fails to disclose or suggest the combination of the presently claimed antioxidant of formula (1) and compound (C)

having a carboxyl group in the polyurethane emulsion that is presently claimed. There is nothing in the prior art that hints at these elements of the present invention.

1. The present invention

The present invention relates to an emulsion of a resin which has the function of oxidation inhibition, and which is obtained by subjecting an antioxidant (A) having two or more alcoholic hydroxyl groups, an optional polyol compound (B), a compound (C) having a carboxyl group and an active hydrogen group, and an organic polyisocyanate (D) to urethanation reaction in an organic solvent to obtain a resin solution, neutralizing the resin solution with a neutralizing agent (E), and then dispersing the resin solution in water. See Specification page 4, second full paragraph. The antioxidant (A) has a specific chemical formula (1). See claim 1.

2. The prior art

A. Bontinck

Bontinck discloses:

An aqueous selfcrosslinkable resin composition which comprises an aqueous dispersion containing at least one polyurethane polymer having anionic salt groups as sole chain-pendant functional groups and which is the reaction product of

(I) an isocyanate-terminated polyurethane prepolymer and
(II) an active hydrogen-containing chain extender selected from the group consisting of water and aliphatic, alicyclic, aromatic or heterocyclic primary or secondary polyamines having up to 80 carbon atoms
and at least one vinyl polymer having chain-pendant acetoacetoxyalkyl ester functional groups.

Bontinck, columns 26 and 27, claim 1. In particular Example 3 of Bontinck states as follows:

512.5 g of a polypropylene glycol having a hydroxyl number of 109.5 mg KOH/g, 77.1 g of 2,2-dimethylolpropionic acid, 243.2 g of 2,4-diisocyanato-1-methylbenzene, 1.6 g of Irganox 245 from CIBA-GEIGY

(triethyleneglycol-bis[3(3-tert-butyl-4-hydroxy-5-methylphenyl)-propionate]) as antioxidant and 208.2 g of N-methylpyrrolidone are introduced into a 2-liter four-necked round-bottomed flask, equipped with a thermometer, a mechanical stirrer, an air condenser, a nitrogen inlet and a dropping funnel. The mixture is heated at 70°-80° C. with stirring for 0.5 hour to complete the reaction, at which point the reaction mixture has an isocyanate content of 0.54 meq/g. 750.0 g of demineralized water and 23.5 g of triethylamine, as the neutralizing agent, are introduced into a dispersing vessel, equipped with an appropriately sized Cowles-type mixing unit and 350.0 g of the above prepared polyurethane prepolymer at 50°-60° C are added slowly with vigorous stirring. Chain extension is carried out through hydrolysis of the isocyanate functionalities and is complete after about 2 hours, resulting in a colloidal dispersion of a fully reacted polyurethane.

See Bontinck, column 12, line 61 to column 13, line 15.

B. Burleigh.

Burleigh discloses:

A waterproof, moisture vapor permeable material comprising: a micro porous polymeric matrix having continuous pores comprising continuous passages extending therethrough and opening into both surfaces thereof, and a moisture-vapor permeable, water-impermeable, hydrophilic urethane polymer having about 0.1 to about 10 weight percent of a hindered phenolic antioxidant reacted into its structure bonded to said microporous polymer matrix wherein said hindered phenolic antioxidant is selected from the group consisting of hindered phenolic antioxidants of the formula

Burleigh, column 23, claim 1.

Further Burleigh mentions:

The present invention provides a novel moisture-vapor permeable, water-impermeable, hydrophilic urethane polymer having a hindered phenolic antioxidant reacted into its structure. The novel polymer which can be included in a number of materials is extremely resistant to degradation from salts, etc. since the antioxidant is not leached out upon contact with dry cleaning solvents. Moreover, surprisingly, the effect of the antioxidant is not diminished by its reaction into the polymer structure.

Burleigh column 2, lines 46-55.

Burleigh also discloses:

Hindered phenolic antioxidants useful in the invention comprise compounds of the general formula $CR[(CH_2)_x-OH]_{3-y}[(CH_2)_q-OP]_y$ wherein R is selected from the group consisting of -H, -CH₃, -C₂H₅, -(CH₂)_wOH, and -(CH₂)₂OP; q is an integer of 0 to 2; x is an integer of 0 to 2; y is an integer of 1 to 2; w is an integer of 0 to 2; and P has the general formula

Burleigh column 2, line 64 to column 3, line 2. Burleigh further mentions that:

Preferred hindered phenolic alcohols of the general formula (I) are those wherein R is --(CH₂)_wOH; q is 1; x is 1; y is 1-2; and w is 2

Burleigh column 11, lines 47-49.

C. Oertel

Oertel discloses:

Stabilizing polyurethanes containing structural segments consisting of an alkylphenol grouping having at least one tertiary alkyl group in the ortho position to the hydroxyl group and preparing said stabilized polyurethanes by reacting a polyisocyanate with a phenol containing at least one tertiary alkyl group in the ortho position to the phenolic hydroxyl group and one aliphatic radical having two groups being reactive with NCO groups, the amount of the phenolic structural segment in the elastomeric polyurethane being in the range of 0.1 to about 10% by weight based on the polyurethane.

Oertel, Abstract.

Further Oertel refers to the description of:

A process for the production of polyurethanes stabilized against discoloration and degradation which comprises reacting a higher molecular weight polyhydroxy compound, a diisocyanate, a chain lengthening agent and 0.1 to 10% by weight of a phenol which contains at least one tertiary alkyl group in the ortho position to the hydroxyl group and one aliphatic radical having two groups which are reactive with isocyanates ... (and) ...

stabilized polyurethanes by using a bifunctional NCO-reactive stabilizer of the phenol type in the polyurethane synthesis.

Oertel, at 3, lines 37-45 and lines 53-56.

3. Distinctions between the prior art and the present invention

"The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness." MPEP §2142. In this case, all of the elements of the present invention are not disclosed or suggested by the asserted references. There is no factual support for the assertion that the prior art discloses an antioxidant having the structure shown in formula (1). The Office therefore has not borne the initial burden of supporting a case of *prima facie* obviousness. The Applicants respectfully submit that this rejection must be withdrawn.

The prior art completely fails to disclose or suggest the particular antioxidant of formula (1) that is presently claimed. The prior art also fails to disclose or suggest the combination of the presently claimed antioxidant of formula (1) and compound (C) having a carboxyl group in the polyurethane emulsion that is presently claimed.

As mentioned by the Examiner, Bontinck completely fails to disclose or suggest using an antioxidant. See Office Action, page 2. This is further by Irganox 245 that is used in Example 3 of Bontinck which has no alcoholic hydroxyl groups. It should also be particularly noted that Bontinck is directed to an aqueous self-crosslinkable resin composition.

Burleigh also fails to disclose or suggest the specific antioxidant that is represented by formula (1) of the present claims, and compound (C) having a carboxyl group. In particular, Burleigh relates to a non-emulsified polyurethane which has anionic groups.

Oertel also completely fails to disclose or suggest the particular antioxidant now recited in claim 1 and represented by formula (1), and compound (C) having a carboxyl group, as well as an emulsifying polyurethane which has anionic groups.

In addition, the present invention provides advantages that one skilled in the art would find surprising and unexpected.

That is, USP 5,541,251 (Bontinck et al) would not improve the antioxidation function of polyurethane since the antioxidant is not chemically incorporated into the polyurethane backbone to bleed out from the polyurethane. Further, USP 5,173,300 (Burleigh et al) and USP 3,536,663 (Oertel et al) would not realize an anionic aqueous emulsion of polyurethane since these references fail to teach the anionic group of the compound (C). Particularly, even if the references were combined with each other, it is difficult to improve the flexibility of an anionic aqueous polyurethane emulsion since the antioxidant has a direct bond or shorter alkylene group between a hindered phenol group and the polyurethane main chain.

In contrast, according to the present invention, the flexibility of an anionic aqueous polyurethane emulsion can be improved since the antioxidant shown by the formula (1) has a flexural ether group between an alkylene group R^1 (bonded to a benzene ring) and an alkylene group or oxyalkylene group (bonded to alcoholic hydroxyl groups). Further, it is expected that the improved flexibility of the polyurethane would inhibit the decrease of antioxidant function.

Accordingly, the prior art completely fails to disclose or suggest all of the elements of the present invention. Since a proper case of obviousness has not been properly established, this rejection must now be withdrawn.

Conclusion

The Applicants respectfully submit that all of the outstanding rejections have been fully addressed and overcome. Early and favorable action of the merits of the present Application is thereby respectfully requested.

Should there be any outstanding matters that need to be resolved in the present Application, the Examiner is respectfully requested to contact J. Mark Konieczny, (Reg. No.

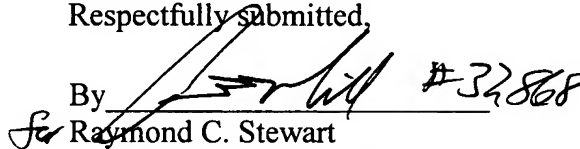
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47,715) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present Application.

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Respectfully submitted,

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